the area of said negative electrode and the area of said positive electrode differ by at least twofold and is such that the element resistance measured between the negative and positive electrodes is minimized,

at least one of said negative electrode and said positive electrode is embedded in the solid electrolyte substrate, and

the area ratio of the negative and positive electrodes is such that the element resistance measured between the negative and positive electrodes is 94% or less than the element resistance of the same sensor except in which the negative electrode and the positive electrode have the same area.

~~31.~~ 30 (Amended) A sensor for detecting an amount of a gas, comprising

an oxygen-ion conductive solid electrolyte substrate having a flat side, a negative electrode and a positive electrode formed on the same flat side of the substrate so as to pump oxygen from the negative electrode to the positive electrode, and a gas diffusion limiting means for limiting the gas diffusing into the negative electrode,

wherein the ratio of the area of said negative electrode to the area of said positive electrode is set within a range of 2:1 to 5:1, and

said sensor comprising a circuit for applying an electric potential between said negative and positive electrodes such that a pump current of less than 100 microamperes flows between the negative and positive electrodes when the sensor is used for detecting the amount of a gas, said pump current being a measurement of the amount of gas.

~~32.~~ 31 (Amended) A sensor for detecting an amount of a gas, comprising

an oxygen-ion conductive solid electrolyte substrate having a flat side, a negative electrode and a positive electrode formed on the same flat side of the substrate so as to pump oxygen from the negative electrode to the positive electrode, and a gas diffusion limiting means for limiting the gas diffusing into the negative electrode,

wherein the ratio of the area of said negative electrode to the area of said positive electrode is set within a range of 1:2 to 1:5, and

said sensor comprising a circuit for applying an electric potential between said negative and positive electrodes such that a pump current of less than 100 microamperes flows between the negative and positive electrodes when the sensor is used to detect the amount of a gas, said pump current being a measurement of the amount of gas.

Claims ~~33-36~~ 32-35 are added as new claims.

~~33.~~ 32 (New) An oxygen sensor for determining the oxygen concentration of a gas, comprising first and second chambers (62, 64) formed between first and second oxygen ion conductive cell substrates (66, 68) and first and second electrodes (68a, 68b) formed on the same plane of the second cell substrate (68), said first electrode (68a) being formed on an inside wall of the second chamber (64) and said second electrode (68b) being formed outside of the second chamber (64),

wherein the area of the first electrode is at least twofold larger than that of the second electrode, and

the sensor comprises a circuit for applying an electric potential in the range of 0.2 V to 1.1 V between the first and second electrodes such that a pump current of less than 100 microamperes flows between the first and second electrodes when the sensor is used to determine the concentration of oxygen in a gas, said pump current being a measurement of oxygen concentration.

~~34.~~ 33 (New) A humidity sensor for determining the humidity of a gas, comprising first and second chambers (62, 64) formed between first and second oxygen ion conductive cell substrates (66, 68) and first and second electrodes (68a, 68b) formed on the same plane of the second cell substrate (68), said first electrode (68a) being formed on an inside wall of the second chamber (64) and said second electrode (68b) being formed outside of the second chamber (64),

wherein the area of the first electrode is at least twofold larger than that of the second electrode, and

the sensor comprises a circuit for applying an electric potential in the range of 1.1 V to 2.5 V between and second electrodes such that a pump current of less than 100 microamperes flows between the first and second electrodes when the sensor is used to determine the humidity of a gas, said pump current being a measurement of humidity.

~~35.~~ 34 (New) An oxygen sensor for determining the oxygen concentration as a component of a gas containing NOx, comprising first and second chambers (62, 64) formed between first and second oxygen ion cell substrates (66, 68) and first and second electrodes (68a, 68b) formed on the same plane of the second cell substrate (68), said first electrode (68a) being

formed on an inside wall of the second chamber (64) and said second electrode (68b) being outside of the second chamber (64),

wherein the area of the first electrode is at least twofold larger than that of the second electrode, and

the sensor comprises a circuit for applying an electric potential in the range of 0.2 V to less than 0.5 V such that a pump current of less than 100 microamperes flows between the first and second electrodes when the sensor is used to determine oxygen concentration as a component of a gas containing NOx, said pump current being a measurement of oxygen concentration.

~~36.~~ 35 (New) The oxygen sensor as claimed in claim ~~35~~ 34, comprising a circuit for applying an electric potential in the range of 0.2 V to less than 0.5 V such that a pump current of less than 10 microamperes flows between the first and second electrodes when the sensor is used to determine oxygen concentration as a component of a gas containing NOx, said pump current being a measurement of oxygen concentration.